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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(71) Applicants (for all designated States except US): HOECHST SCHERING AGREVO PTY. LIMITED [AU/AU]; 1731-1733 Malvern Road, Glen Iris, VIC 3146 (AU). AGREVO UK LIMITED [GB/GB]; Hauxton, Cambridge CB2 5HU (GB).

(72) Inventors; and

(75) Inventors/Applicants (for US only): MORROW, Philip, McLaughlin [AU/AU]; 9 Kelly Close, Baulkham Hills, NSW 2153 (AU). GLOVER, Andrew, John, Alexander [AU/AU]; 11 Havilah Avenue, Wahroonga, NSW 2076 (AU). FRASER, Gregory, Stuart [AU/AU]; 43 Catalpa Crescent, Turramurra, NSW 2074 (AU). FEEZ, Anthony, Mowbray [AU/AU]; 14 Bruckner Street, The Gap, QLD 4061 (AU). CRAMPTON, Peter, Leslie [GB/GB]; 18 Mulberry Close, Tring, Herts GP23 5DZ (GB).

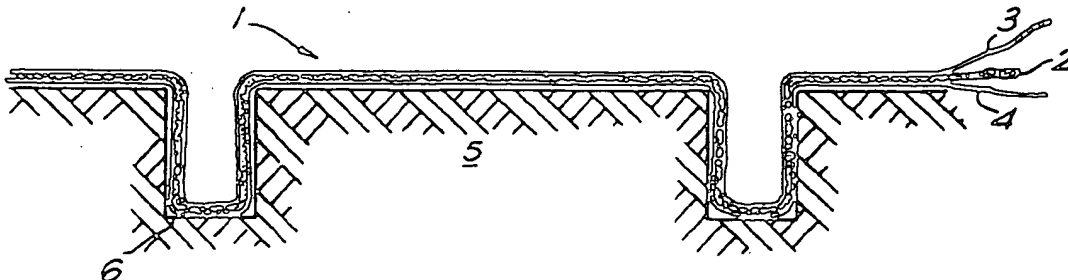
(74) Common Representative: AGREVO UK LIMITED; Sewell, R., C., Patent Dept., Chesterford Park, Saffron Walden, Essex CB10 1XL (GB).

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(54) Title: PESTICIDAL BARRIER



(57) Abstract

The invention relates to a laminar pesticidal barrier (1) for covering the ground beneath a building or cultivated area comprising an upper portion (3) and a lower portion (4) each of which comprises a layer substantially impermeable to pesticide, and a foraminous pesticide-containing layer (2) between said portions.

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Pesticidal BarrierTechnical Field

- 5 The invention relates to pesticidal barriers and particularly to dual-purpose  
pesticidal-moisture barriers for use in the construction industry for protecting  
building foundations from subterranean attack from pests and moisture,  
particularly termites. However the invention is not intended to be limited to the  
construction industry, but also finds utility in any situation where the entry of  
10 pests need preventing across a large area, for example cultivated areas in  
agriculture and horticulture. In addition, the invention is not intended to be limited  
to termites, but forms an effective barrier to other pests such as weeds, fungi,  
insects and the like, when used in conjunction with a suitable pesticide.

15 Background Art

- In many countries of the world, particularly in tropical and sub-tropical regions,  
buildings are susceptible to attack from subterranean pests, especially termites. In  
such countries it is prudent to take preventative action to prevent pests entering  
buildings. Such preventative action involves creating a barrier, typically a  
20 pesticidal barrier, to prevent access of the pest.

- It is both more convenient and more effective if such a barrier is created prior to  
construction such that it covers the area underneath the building including its  
footings. For a number of years it has been commonplace to create pesticidal  
25 barriers by spraying high doses of toxic and/or persistent pesticides, particularly  
organophosphate and organochlorine compounds directly into the ground beneath  
the building prior to construction. However, this practice results in environmental  
contamination, food chain entry and bio-accumulation, and its practice is forbidden  
in a number of countries.

30

A number of attempts have been made to reduce the environmental damage  
caused by the above-mentioned pesticidal barriers. For example, WO 90/14004  
(Sapsford) describes a method of creating a pesticidal barrier prior to building  
construction which comprises lining a building excavation with a fibrous blanket

and then impregnating it with an insecticide. EP 0 565 250 (Albany) describes a preferred fibre assembly which improves the performance and durability of this pesticidal barrier. These blanket-type barriers, however, suffer from a number of drawbacks. For example, environmental contamination, food chain entry and bio-accumulation is still a problem since harmful amounts of pesticide can still leach from the blanket into the surrounding soil. In addition, these blankets do not protect the pesticide contained therein from chemical or biological degradation. In particular, many pesticides degrade when exposed to alkaline media, such as leachate from the concrete footings of buildings.

It is clearly desirable for the protection afforded by the pesticidal barrier to exceed the lifetime of the building. However, due to problems of leaching and degradation this cannot be ensured. US 5,359,806 (Albany) describes a rechargeable blanket to address this problem by incorporating a network of tubes through which the blanket can be impregnated with pesticide throughout the lifetime of the building.

A further drawback of these fibrous blankets is that soil and grit become embedded in the blanket. This encourages the pesticide to diffuse out of the blanket thereby reducing its performance and longevity.

In addition, the abovementioned fibrous blankets do not facilitate on site fabrication. For example, they cannot be joined effectively with adhesive tape. Any resulting gap in the blanket forms a potential route for pest ingress making the barrier largely ineffective.

In Kokai 59-62503 (Ikari) there is described an insect- and moisture-proof barrier, which comprises a paper sheet (Kraft Paper) impregnated with insecticide sandwiched between polyethylene outer layers. However, this type of barrier also suffers from a number of drawbacks which may explain its lack of commercial success. For example, the barrier is relatively delicate and may not withstand the harsh treatment commonly experienced on a building site. Any resulting tear or hole in the blanket will render it ineffective as a barrier to pests. In addition, Kraft paper being cellulose provides an attractive food source for pests, particularly

termites, and therefore rather than deterring pests away from the barrier may actually attract them.

5 A further problem with all of the abovementioned pesticidal barriers is the requirement to use protective clothing to limit exposure of the construction worker to the pesticide, when laying a pre-impregnated blanket or when spraying.

10 We have now developed a simple yet ingenious invention which in addition to addressing the above mentioned problems, also provides a more effective barrier to termites.

#### Disclosure of Invention

15 According to an aspect of the invention there is provided a laminar pesticidal barrier for covering the ground beneath a building or cultivated area comprising, an upper portion and a lower portion each of which comprises a layer substantially impermeable to pesticide, and a pesticide-containing layer between said portions, characterised in that the pesticide-containing layer is foraminous.

20 It will be appreciated that the invention functions as an effective pesticidal barrier in any orientation. For example the barrier can be situated vertically to prevent pest ingress from the side or lain horizontally to prevent pest ingress from beneath. Typically however the barrier will be used to completely line an excavation, such as a trench. In this instance the barrier prevents pest ingress from beneath and from the side. For the purposes of conciseness therefore the  
25 term "upper portion" refers to the portion of the blanket between the pesticide-containing layer and the building footings, and the term "lower portion" refers to the portion of the barrier between the pesticide-containing layer and the ground.

30 We have found that pesticidal barriers made in accordance with the invention provide a number of advantages over prior art pesticidal barriers.

In the unlikely event that pests breach the lower portion of the barrier, the foraminous nature of the pesticide-containing layer will prevent progress of other pests across the barrier. During tests we have discovered that pests, particularly

termites, become entangled in foraminous material. Entanglement both drastically hinders termites' progress and as they struggle to untangle themselves they are exposed to fatal quantities of insecticide.

- 5 A further advantage of our invention is that the upper and lower portions prevent soil particles and grit clogging the foramina in the pesticide containing layer.

In addition, the invention provides a robust pesticidal barrier which will withstand the harsh environment of a building site during installation and building  
10 construction. The robustness is due to the foraminous nature of the pesticide-containing layer which cushions the lower portion of the barrier. Thus even if the upper portion is accidentally damaged during installation and construction, the lower portion will typically remain intact.

- 15 A particular advantage of our pesticidal barrier is its self-sealing properties. In the unlikely event that a hole occurs in the barrier either due to pest attack or construction activity, the natural movement of the foraminous layer will act so as to seal any such hole and maintain the integrity of the barrier to pests.

- 20 To further improve the pesticidal barrier's robustness and self-sealing properties, we have found it advantageous that the pesticide-containing layer is flexible.

During development of our invention we have discovered that the longevity of the blanket can be improved by manufacturing it from materials which do not form a  
25 staple food source for the particular pest. For instance, cellulose forms the staple diet of termites and accordingly termite barriers should not contain cellulose, such as Kraft paper. We have found it preferable that the pesticide-containing layer comprises synthetic material.

- 30 In many countries of the world, buildings also need to be protected from subterranean moisture ingress. The ingress of moisture or rising-damp can lead to a number of undesirable consequences. For example, dampness typically is detrimental to the internal decor of a building, for example it may cause wall-paper to peel-off. In addition, rising-damp may encourage fungal growth which in turn

may attract other pests, such as termites. We have found that our invention also performs as an effective moisture barrier. Thus, in a preferred embodiment at least one of the upper or lower portions is impermeable to moisture.

5 As mentioned above, our invention finds particular utility in the construction industry because of its dual role as a pesticide / moisture barrier. The barrier is typically lain underneath a building prior to the laying of the concrete foundations which are built directly on top of the barrier. Accordingly it is important that the upper portion of the barrier is sufficiently robust to withstand the construction of  
10 the building foundations. Therefore, in a preferred embodiment the upper portion of the barrier is more resistant to rupture than the lower portion. In a preferred example, resistance to rupture of the upper portion may be achieved by increasing its thickness relative to the lower portion. Preferably the upper portion is between 150 and 250 microns thick and the lower portion is between 75 and 125 microns  
15 thick.

We have found it convenient for both upper and lower portions each to consist of a single layer which combines the above mentioned properties of being impermeable to pesticide, and/or moisture, and/or resistant to rupture. Therefore  
20 in a preferred embodiment the upper and lower portions are polyethylene.

Plastic materials such as polyethylene are known to degrade when exposed to sunlight which may be a problem when pesticidal barriers according to the invention are stored outdoors for significant periods. Therefore we have found it  
25 advantageous to provide at least one of the upper or lower polyethylene portions with a UV stabiliser.

The term foraminous when applied to the foraminous layer is intended to include any material which contains passageways. Examples of suitable foraminous layers  
30 are woven materials, sponges and foams. Preferably the foraminous material is a fibrous mat wherein the fibres are from 4 to 8 denier and the fibre crossing points are 100 microns apart, and wherein the average void volume of the mat is 85% at 10 kPa.



For the same reasons as mentioned above we have found it preferable to fabricate the mat from fibres which are not edible to a particular pest, i.e. synthetic fibres. Preferred synthetic fibres are nylon, polypropylene, polyacrylonitrile and polyester.

- 5 We have found it preferable to confine the pesticide-containing layer within the barrier by sealing the upper and lower portions together around the perimeter of the pesticide-containing layer, such that its movement is prevented. Alternatively, the pesticide-containing layer may be bonded to the upper and lower portions, for example under the influence of heat. However, it is preferred to adhesively bond
- 10 the pesticide-containing layer to at least one of the upper or lower portions. Adhesive bonding increases resistance to rupture and also increases its impermeability to pesticide and moisture.

- The invention provides an effective barrier to many pests, especially insects when
- 15 the pesticide-containing layer contains at least one insecticide. In particular, the invention provides an excellent termite barrier when a suitable termiticide is present. Particularly suitable insecticides and termiticides may be selected from the pyrethroid group.

- 20 We have also found that our invention is a particularly effective insect and termite barrier when the insecticide/termiticide comprises a low vapour pressure solid, preferably when present in particulate form of less than 5 microns in size. We have found that such a solid diffuses from the barrier more slowly than the liquid formulations and therefore increases the longevity of the barrier. Preferred solid
- 25 insecticides include fipronil, alpha-cypermethrin, beta-cypermethrin, and particularly deltamethrin. In addition, many of the above-mentioned advantages may be realised when liquid insecticides/termiticides are incorporated in solid formulations, for example as dusts, wettable powders or water dispersible granules.

- 30 Fungi and moulds are particularly favourite food sources of termites and any such source will attract them. In fact it is well-known for termites to actively cultivate fungi within or near to their nests. Because of this attraction which termites have for fungi, we have found it beneficial to include a fungicidal agent in the pesticide

containing-layer of our invention to prevent fungal growth therein, thereby reducing the likelihood that termites will be attracted to the barrier. Particularly effective fungicides include the azole group of fungicides, such as prochloraz, cyproconazole, propiconazole, tebuconazole, azaconazole or carbendazim.

5

As mentioned above the pesticidal barrier is not limited solely to use as an insecticide or termiticide barrier. For example, when the pesticide-containing layer contains a herbicide, weeds will be prevented from passing through the barrier. Such a herbicidal barrier finds utility in the production of turf, when lain beneath

10 turf the barrier will prevent weeds passing through the barrier and contaminating the turf. In similar fashion, the invention finds utility as a barrier to fungi and moulds when the pesticide-containing layer contains a fungicide. Particularly effective fungicides include the azole group of fungicides, such as prochloraz, cyproconazole, propiconazole, tebuconazole, azaconazole or carbendazim.

15

The invention is also directed to methods for installing and manufacturing the pesticidal barrier. Such methods would be readily apparent to a skilled person.

#### Brief Description of Drawing

20 The invention will now be described by way of example only with reference to the following figures.

Figure 1 shows a side-sectional view of a laminar pesticidal barrier in position prior to laying foundations for a building.

25

Referring to Figure 1 there is shown a laminar pesticidal barrier 1. Barrier 1 comprises a pesticide-containing layer 2 and upper and lower portions 3 and 4 respectively. The edges of barrier 1 show both upper and lower portions extending beyond pesticide-containing layer 2 (layers 3 and 4 are depicted separated at the

30 right hand edge of the barrier to enhance clarity). Pesticide-containing layer 1 is preferably a mat of fibre. Preferred fibres are synthetic such as nylon, polypropylene and titanium dioxide.

8

As shown in Figure 1, following excavation of the ground 5 beneath the building, including digging of the footings 6, the barrier is fitted such that it covers the ground and lines the footings. Typically, the concrete slab which forms the foundations is created using formwork (not shown), which is positioned around the excavated ground 5, such that when the concrete has set it does not extend past barrier 1. Thus barrier 1 prevents pests, particularly termites, and moisture reaching the concrete slab of the building. Furthermore, impermeable upper and lower portions 3 and 4 prevent leachate, from *inter alia* the concrete slab, degrading the pesticide.

10

Throughout this specification and claims which follow, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any integer or group of integers.

15

CLAIMS

- 1 A laminar pesticidal barrier (1) for covering the ground beneath a building or  
cultivated area comprising, an upper portion (3) and a lower portion (4)  
5 each of which comprises a layer substantially impermeable to pesticide,  
and a pesticide-containing layer (2) between said portions, characterised in  
that the pesticide-containing layer is foraminous.
- 2 A laminar pesticidal barrier according to claim 1 wherein the foraminous  
10 pesticide-containing layer (2) is flexible.
- 3 A laminar pesticidal barrier according to any preceeding claim wherein the  
foraminous pesticide-containing layer (2) comprises synthetic material.
- 15 4 A laminar pesticidal barrier according to any preceding claim wherein at  
least one of the upper and lower portions (3 or 4) is impermeable to  
moisture.
- 5 A laminar pesticidal barrier according to any preceding claim wherein the  
20 upper portion (3) is more resistant to rupture than the lower portion (4).
- 6 A laminar pesticidal barrier according to any preceding claim wherein the  
upper portion (3) is between 150 and 250 microns thick and the lower  
portion (4) is between 75 and 125 microns thick.  
25
- 7 A laminar pesticidal barrier according to any preceding claim wherein the  
upper and lower portions (3 and 4) are fabricated from polyethylene.
- 8 A laminar pesticidal barrier according to claim 7 wherein at least one of the  
30 polyethylene portions (3 or 4) contains a UV stabiliser.
- 9 A laminar pesticidal barrier according to any preceding claim wherein the  
pesticide-containing layer (2) is a fibrous mat.

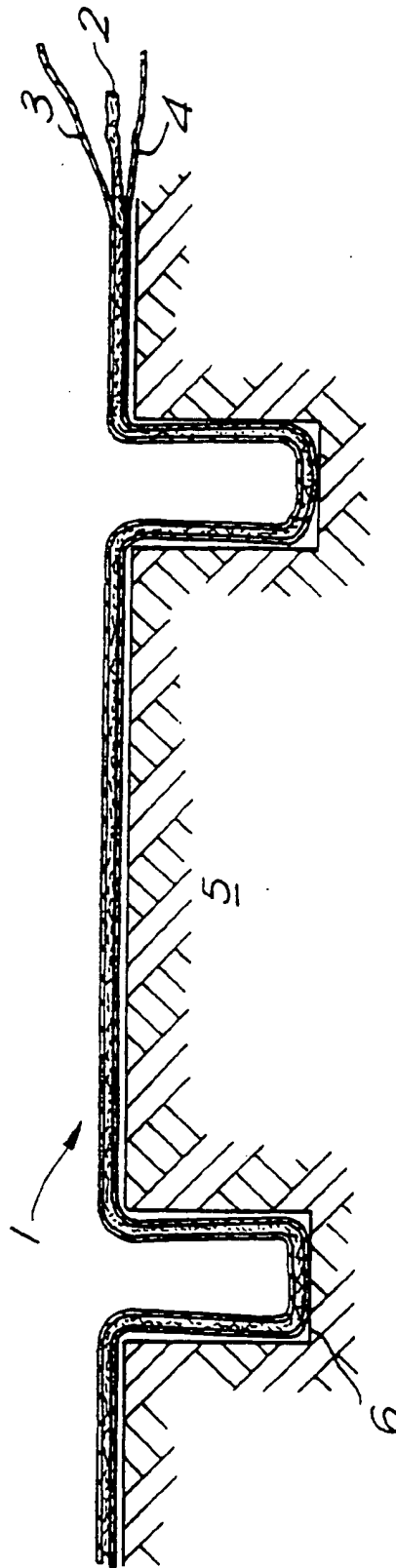
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- 10      10      A laminar pesticidal barrier according to claim 9 wherein the fibres of the fibrous mat are 4 to 8 denier and the fibre crossing points are 100 microns apart, and wherein the average void volume of the mat is 85% at 10 kPa.
- 5      11      A laminar pesticidal barrier according to claim 9 or 10 wherein the fibrous mat (2) includes nylon and/or polypropylene fibres.
- 12      A laminar pesticidal barrier according to any preceding claim wherein the pesticide-containing layer (2) is bonded to the upper and lower layers (3 or 4).
- 10      12      A laminar pesticidal barrier according to any preceding claim wherein the pesticide-containing layer (2) contains at least one insecticide.
- 15      13      A laminar pesticidal barrier according to claim 13 wherein said insecticide comprises at least one termiticide.
- 15      A laminar pesticidal barrier according to claim 13 or 14 wherein said insecticide comprises a pyrethroid.
- 20      15      A laminar pesticidal barrier according to claim 13 to 15 wherein said insecticide comprises a low vapour pressure solid.
- 16      A laminar pesticidal barrier according to claims 15 and 16 wherein said insecticide comprises deltamethrin.
- 25      16      A laminar pesticidal barrier according to any of claims 13 to 17 wherein the pesticide-containing layer (2) further contains a fungicide.
- 18      A laminar pesticidal barrier according to any of claims 1 to 12 wherein the pesticide-containing layer (2) contains at least one fungicide.
- 30      19      A laminar pesticidal barrier according to any of claims 1 to 12 wherein the pesticide-containing layer (2) contains at least one herbicide.
- 20      A laminar pesticidal barrier according to any of claims 1 to 12 wherein the pesticide-containing layer (2) contains at least one herbicide.

- 21     A laminar pesticidal barrier including an inner layer (2) formed from a material that is capable of holding a pesticide and upper (3) and lower (4) outer layers that are arranged and adapted to prevent contact with the inner layer (2) wherein the inner layer is a woven, foraminous and fibrous mat.
- 5

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Fig.1.



## INTERNATIONAL SEARCH REPORT

 International Application No.  
**PCT/IB 97/00583**
**A. CLASSIFICATION OF SUBJECT MATTER**
 Int Cl<sup>6</sup>: A01M 1/20, 1/24, 21/00; A01N 25/34; E01H 11/00; E04B 1/72; B32B 5/00, 33/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

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 IPC<sup>6</sup>: A01M 1/20, 1/24, 21/00; A01N 25/34; E01H 11/00; E04B 1/72; B32B 5/00, 33/00

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU 62329/90 A (TRIM) 14 March 1991. Sec page 5 line 10 to page 6 line 30	1, 21
X	AU 32834/93 (662035) B (CASA BERNARDO LTDA) 18 August 1994 Sec figure 2	1, 21
Y	GB 2098541 A (CALIGEN FOAM) 24 November 1982 Sec claims 8, 21 and 38	1
X		21

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☒ See patent family annex

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Date of the actual completion of the international search

20 June 1997

Date of mailing of the international search report

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Authorized officer

**DAVID LEE**

Telephone No.: (06) 283 2107



## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/IB 97/00583

C (Continuation)

## DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y X	WO 90/14004 A (CHEMICAL ENTER. (AUST)) 29 November 1990 See page 3 lines 3-35, figures 1 and 2B	1 21
X, P	AU 52454/96 A (MANN) 5 December 1996	1, 21
X Y	AU 48655/90 A (GROOM) 2 August 1990 See figure 3	1 21
Y	JP 01-058739 A (ASAHI CHEMICAL) 6 March 1989	1, 21
Y	US 4929497 A (MITCHELL et al) 29 May 1990	1, 21
Y	US 4666767 A (VON KOHORN) 19 May 1987 See column 12, lines 50-56, column 13 lines 9-25, column 7 lines 27-46	1, 21
Y	WO 95/18532 A (CECIL SA) 13 July 1995 See figures 1, 2	1, 21
Y	AU 82443/91 (640256) B (M.J.A. SCIENTIFICS) 27 February 1992	1, 21
A	AU 16163/95 A (GUARDIAN PEST & WEED CONTROL) 5 October 1995	

# INTERNATIONAL SEARCH REPORT

## Information on patent family members

International Application No.

PCT/IB 97/00583

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Patent Document Cited in Search Report	Patent Family Member
GB 2098541	NONE
WO 90/14004	AU 56607/90
AU 52454/96	NONE
AU 48655/90	NONE
JP 01-058739	NONE
US 4929497	AT 93573 AU 49287/90 BR 9000817 CA 2012353 EP 390428 ES 2043272 JP 03-047391
US 4666767	AR 198257 AT 9340/73 AU 61087/73 BE 807146 B4 7308751 CA 1025770 DE 2356155 ES 419946 FR 2206051 GB 1391248 IL 43309 IN 140712 IT 999741 JP 49-079859 JP 58-032944 NL 7315293 TR 18172 ZA 7307999 US 4160335 US 4639393
WO 95/18532	AU 13886/95 CN 1142745 EP 738108 FR 2714685
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AU 16163/95	NONE
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